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ABSTRACT

This report, prepared by the National Clearinghouse for Drug Abuse Information, presents information on the deliberate inhalation of volatile substances--the treatment modalities, the pharmacology and chemistry of this drug abuse, and the opinions and practices of recognized authorities in the field. Substances which are currently being inhaled to alter subjective states are divided into three basic classes: the commercial and related volatile solvents, aerosols and anesthetics. Statistics show that the overwhelming majority of those who inhale solvents and aerosol products are young people between the ages of 10 and 15 years. The report describes treatment processes, and psychological, physiological and subjective effects of inhalation. The legal status of those caught illicitly using inhalants is reviewed along with other important issues and opinions on the topic. (Author/PC)

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The National Clearinghouse for Drug Abuse Information recognizes the need for clarifying some of the more complex issues in drug abuse by gathering the significant research findings on each subject and developing fact sheets on the problem. These fact sheets, which are part of the Clearinghouse Report Series, present information about treatment modalities, the pharmacology and chemistry of the various drugs of abuse, and opinions and practices of recognized authorities in the field. This publication was researched and written by James R. Gamage and E. Lief Zerkin of the Student Association for the Study of Hallucinogens (STASH), Beloit, Wisconsin, under Contract No. HSM-42-72-231.

THE DELIBERATE INHALATION OF VOLATILE SUBSTANCES

History

The voluntary inhalation of substances for the purpose of mood alteration is a practice that can be traced to the earliest civilized times. The ancient Hebrews regarded the breathing of vapors from burning spices as an integral part of worship, which "rejoiced the heart." Greeks at Delphi induced states of ecstasy by inhaling cold gasses which emanated from clefts of rocks. South American Indians have for centuries employed hallucinogenic-like snuffs (containing tryptamine derivatives and harmala alkaloids) in mystical religious ceremonies to mark the rites of passage of their young.

Several societies appear to have independently discovered the fact that inhalation is a very efficient method of transporting the active ingredients of drug preparations to the brain with extreme rapidity. Inhalation is a favorite method of self-administration for some users of cocaine, heroin, and a wide variety of gaseous and volatile substances which have the ability to markedly alter an individual's subjective and physiological state.

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The appearance of this group of inhalants is a concomitant of latter day medical and industrial technology. This technology was first ushered in by the discovery, by Sir Humphrey Davy in 1799, that nitrous oxide could reduce an individual's subjective response to pain. The path to this discovery, however, spanned two decades from the time of Sir Joseph Priestley's synthesis of nitrous oxide. This period was largely spent by Davy in the exploration of the recreational potential of the gas. Nagle (1968), who surveyed the literature surrounding the emergence of nitrous oxide, comments that Davy and his co-experimenters (among whom were several noted literary figures) were "a group of gay spirits who were perhaps more interested in seeking 'pleasurable effects'--getting drunk--than in scientific research." Other references cited by Nagle (1968) indicate that the use of the gas for its "exhilarating effects" was endemic among American medical students in the late 19th century. One of these students, Gardner Quincy Colton, in fact, dropped out of medical school to market nitrous oxide as a social intoxicant.

Chloroform was discovered in the United States, Germany, and France, simultaneously and independently in 1831. Liquefied at room temperature, it gives off highly potent vapors when inhaled. Its American discoverer, Samuel Gutherie, favorably compared it to whiskey. He noted that it is faster acting than ether, a factor which probably accounts for its early addicts.

In Scotland it was introduced by Dr. James Y. Simpson for anesthesia during surgery and childbirth. Eventually, however, chloroform's popularity decreased because of increased interest in other anesthetics and because of its hazards of sudden death from overdose. Brecher reports that the use of chloroform for addiction is now considered rare, but not extinct, as evidenced by Nagle in the Bulletin of the Menninger Clinic (1945) and the Journal of the American Medical Association (1963).

Jaffe (1965) has reported that another consciousness-altering gas, ether, was employed in Ireland at the turn of the 20th century following massive efforts to reduce the incidence of alcoholism in that country. The number of ether "jags" or parties, both in the United States and the United Kingdom, however, soon became a matter of predominant social concern and resulted in widespread "reeducation of the public to the use of alcohol."

Gasoline, kerosene, and related distillates of petroleum were much slower to emerge as consciousness-altering substances. Isolated instances of individuals who accidentally discovered the intoxicating properties of gasoline were reported in the literature in the early part of this century (Nunn et al. 1934), but it was not until the 1950's and 1960's that the practice evoked substantial concern.

By far the most serious epidemic of substance inhalation was the pattern of glue-sniffing which developed in the 1960's. The first known mentions of glue-sniffing appeared in 1959 and concerned arrests of children in Tucson, Arizona; Pueblo, Colorado, and other western cities (Brecher 1972). By the end of the decade the

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inhalation of glue, other volatiles and aerosols was widespread enough to provoke over 200 articles, case reports, and reviews in the professional medical literature. By 1970 Bass had collected case reports of over 110 children who had died following inhalation of these substances.

Definitions

For the purposes of this review, substances currently being inhaled to alter subjective states will be divided into three basic classes: the commercial and related volatile solvents, aerosols, and anesthetics.

Volatile Solvents

The commercial and related volatile solvents include a large range of substances all of which, to a greater or lesser degree, are capable of producing similar intoxicating effects. The most important representative of this class is plastic (model) cement which, in its varying commercial formulations, may contain the following substances: toluene, acetone, naphtha, aliphatic acetates, hexane and cyclohexane. Related to the model airplane glues are household cements which contain the following: toluene, acetone, isopropanol, methyl and ethyl ketone, and methyl isobutyl ketone. Fingernail polish removers (made up of acetone, aliphatic acetates, benzene or alcohol) and lacquer thinners (mixtures of toluene and higher alcohols) are also subject to considerable misuse. Petroleum products, most commonly gasoline, kerosene, and lighter fluid, are also grouped in this class.

Aerosols

Aerosols, according to the most recent definition approved by the aerosol scientific committee of the Chemical Specialties Manufacturers Association (Wisconsin Department of Health and Social Services, 1972), are liquid, solid or gaseous products (or mixtures of the three) which are discharged by a propellant force of liquefied and/or nonliquefied compressed gas, usually from a disposable container through a valve. Most aerosols contain three major components: Propellants, solvents and active ingredients, packaged under pressure. The most commonly used propellants in the industry are difluorodichloromethane (referred to as propellant 12) and hydrocarbon isobutane. Currently, over 300 different types of products are marketed in aerosol form and variations between brands allow the consumer an even wider selection. Aerosols that have been misused include hair sprays, deodorants, insecticides, glass chillers, and vegetable frying pan lubricants, all of which contain gasses of chlorinated or fluorinated hydrocarbons.

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Anesthetics

The last class of inhalants, the anesthetics, includes substances which are only infrequently misused, due to a widespread lack of knowledge of their intoxicating properties and comparatively restricted availability on the consumer market. These substances include ether, chloroform, nitrous oxide, and related gasses. In all probability, nitrous oxide is the most widely employed member of this class; it is available commercially as a tracer gas to detect pipe leaks, as a whipped cream propellant, and as a pressurized product designed to reduce preignition in racing cars.

Patterns of Use

The overwhelming majority of those who inhale solvents and aerosol products are young people between the ages of 10 and 15 years. A small number of elementary school youths under the age of 10 are, however, known to indulge in the practice. Glue sniffing and aerosol abuse have been sporadically reported in adults (Merry and Zachariades 1962), as has the misuse of pure toluene (Grabski 1961) and ether (Bartholomew 1962). The only reports of widespread abuse of solvents among the teenage population have come from prison studies and descriptions of other atypical populations that have been denied access to alcohol and other acceptable social intoxicants (Press and Done 1967a).

Press and Done (1967a) and Rubin and Thomas (1968) have independently developed rather similar typologies of glue and aerosol sniffing, both involving distinctions between two classes of sniffers. The first and largest group of users is experimental in nature; these children try sniffing as a novel new experience, but discard the practice after a few exposures. Typically, experimental sniffing takes place during school vacation or at other times when there is "nothing better to do with one's time." One of the prime characteristics of recreational use is that it does not seriously disrupt the child's long-term ability to function; he may experience acute episodes of belligerence or deviant behavior, but these do not figure importantly in his development.

In contrast, the problem-centered sniffers employ a wide variety of inhalants over periods ranging from 1 to 5 years. In almost all instances, sniffing becomes an important behavioral and social involvement which most clinicians regard as a significant threat to their ability to function in school, the family and the peer group. These problem glue sniffers seem to differ from other delinquents as well as from nondelinquents in that they can best be described as disinterested in their surroundings and their development. Adaptation to the pressures of maturation is exhibited by withdrawal and inactivity.

In most epidemiological investigations, sniffing habituees seem to be predominantly male (by an average ratio of 10:1), and there are marked overrepresentations of minority groups, including blacks, Chicanos, American Indians and Puerto Ricans.

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Most have long histories of family instability and failure in school and come from poor socioeconomic, inner-city areas.

Perhaps because they are employed on a much more restrictive scale, nitrous oxide and related anesthetics exhibit markedly different user patterns. One study by Lynn et al. (1972) indicates that the nonmedical use of nitrous oxide in mid-Michigan, for example, is by no means rampant, but has been steadily increasing. A total of 34 volunteers self-administered pure nitrous oxide. Subjective findings generally indicated pleasurable effects were similar for the subjects. Cognitive defects were noted during the peak high but returned to normal within 5 minutes.

Chemistry, Pharmacology and Toxicology

With the exception of carbon monoxide, most of the solvent-like substances that are inhaled are fat soluble. As such, Glaser (1966) has speculated that they may be expected to pass the blood-brain barrier very rapidly; their lipid solubility also hints at myelin as a possible site of action.

Most of the volatile hydrocarbons formed in aerosols are eliminated unchanged by the lungs; trichloroethylene is metabolized by the liver, however, and excreted through the kidneys. The principal pharmacologic action of aerosol propellants is that of central nervous system depression or anesthesia; this mild anesthesia probably contributes to the high that the sniffers are seeking (Wisconsin Department of Health and Social Services 1972).

Nitrous oxide is relatively insoluble in blood, its blood to air partition ratio being 0.47, compared to 12.0 for ether. The compound does not combine with hemoglobin and is carried in the blood only in physical solution (Price and Dripps 1965). Nitrous oxide is excreted in unchanged form through the lungs, but a small fraction, owing to the rapid diffusion of the gas, escapes through the skin. Medically, nitrous oxide is an effective anesthetic, when combined with oxygen in a pressurized environment. The gas also has a marked analgesic action in subanesthetic concentrations; inhalation of a 20 percent concentration of the gas in 80 percent oxygen is claimed to be as effective as 15 mg. of morphine.

The development of tolerance to glue and related volatile solvents has been confirmed by Press and Done (1967b); indeed, tolerance failed to develop in instances of very brief usage or where intensity of exposure (as judged by symptomatology) was relatively light. In most children, tolerance was observed within 3 months following weekly usage, and in some instances it became striking. One individual, for

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example, achieved less pronounced effects from eight tubes of plastic cement than was obtained 3 years earlier with one tube. Press and Done (1967b), however, failed to detect any reliable signs of withdrawal or physical dependence on volatiles. Barker (1963) in investigations of boys confined to a training institution in Colorado noted lethargy and depression in some cases after cessation of glue inhalation, but also could not establish a definitive withdrawal syndrome. Merry and Zachariadis (1962), however, claim that symptoms reminiscent of delirium tremens (without delusion) appear regularly following withdrawal from toluene-containing products. In contrast to observations with volatiles, Brecher (1972) contends that no tolerance development has been demonstrated for nitrous oxide. Users do not feel a tendency to increase the dose of the gas at each inhalation--on the contrary, they claim that, with experience, increased effects are produced with smaller quantities of the drug.

It has been demonstrated that all substances capable of being inhaled for mood alteration display toxicity after acute or chronic exposure. Nitrous oxide is perhaps the least toxic of this class of drugs; it is only after repeated exposures for 24 hours or more that the drug may depress the bone marrow and cause death due to impaired ability to form blood cells (Lassen et al. 1956; Wilson et al. 1956). Exposures to lesser quantities of the gas over shorter periods (which more closely replicate the conditions of street usage) have no demonstrated lethal potential. The majority of data on the potential toxicity of volatiles reported in the literature is based on information projected from studies on humans who were exposed chronically to solvents in industrial settings and from animal experiments, where exposure was limited to low concentrations over prolonged periods of time (Press and Done 1967a). It is difficult, therefore, to predict the degree to which this data can be extrapolated to street-use situations where exposures are intermittent, but intensive. For example, the concentration of toluene inhaled when a tube of glue is spread on gauze is approximately 50 times the allowable industrial exposure.

Several cases of deaths following inhalation of volatile solvents and aerosols in youngsters have been reported. In a survey of the known cases in the 10-year period from 1960 to 1970, Bass (1970) noted at least 110 fatalities which could be directly attributed to the toxic actions of gasoline, toluene, benzene, trichloroethane, and fluorocarbon aerosol propellants. Many youths also died as a result of plastic bag suffocation.

In deaths not due to suffocation, the terminal event "is quick and may occur after only several deep inhalations" (Bass 1970). Closer investigation has, however, shed doubt on previous speculation that aerosol sniffing results in freezing of the vocal cords and pulmonary irritation with massive edema. In fact, it was found that the sniffer does not inhale the volatile hydrocarbons while they are in the cold state. The rapidity of death (in many cases occurring after a few minutes) also calls into question the classical textbook explanation of death being due to progressive medullary failure. Bass (1970) in his review has advanced an hypothesis which links sudden inhalation death with stress-induced elevated catecholamine

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levels. Eyewitnesses of several cases of sudden sniffing deaths noted that most of the victims engaged in physically strenuous activity (such as running shortly after taking a few very deep inhalations of solvents or aerosols). This type of stress, according to Bass (1970), encouraged the release into the circulation of quantities of adrenaline and noradrenaline. Orth et al. (1939), further have demonstrated that adrenaline and noradrenaline potentiate the cardiac effects of the volatile hydrocarbons. Since hypercapnia resulting from bag breathing will also potentiate the pharmacological effect of solvents (Price et al. 1958), it appears that anyone engaged in inhalation with a plastic bag while in a physically stressful situation is a likely candidate for sudden death from cardiac arrest (Wisconsin Department of Health and Social Services, 1972).

The volatile hydrocarbons present as propellants in most of the aerosols implicated in sudden inhalation deaths include trichlorofluromethane, dichlorodifluromethane, and cryfluorane. In studies with rats, Stewart and Andrews (1966) demonstrated very low toxicity levels to these compounds upon acute inhalation. An additional volatile hydrocarbon, 1,1,1-trichloroethane, is also present in many aerosols. This compound was tested by Adams and his colleagues (1950) at exposure levels of 18,000 parts per million; at this dosage level, rats exhibited 100 percent survival at 18 minutes and 50 percent survival at 3 hours. Organic injury at autopsy appeared insignificant, even after exposure periods which produced the highest levels of kills. Hall and Hine (1966) have reported two cases of sudden death linked to aerosols containing trichloroethane (furniture polish and spot remover), and suggested that chemical pneumonia combined with respiratory arrest were responsible for the deaths.

Reliable information on the toxicity levels of petroleum products (such as kerosene, gasoline, and naphtha) is difficult to arrive at in view of the fact that these products are unpredictable mixtures of various petroleum hydrocarbons which may vary considerably from one formulation to another. For example, gasoline, and in particular those brands with high octane ratings, may contain varying amounts of aromatic hydrocarbons including benzene, in addition to a number of unknown additives. In general, petroleum distillates produce narcotic effects similar to those described for toluene, but with a greater likelihood of severe depression or excitation. When substantial concentrations of benzene (or, to a lesser extent, xylene) are present, the possibility of severe bone marrow depression is present (Press and Done, 1967a).

Treatment

Glaser (1966) asserts that because acute intoxication from solvent inhalation is of fairly short duration, it rarely presents itself for treatment. In the eventuality that inhalation psychosis does come to the attention of physicians, he recommends that principles of the management of acute delirium be followed. Reminiscent of the "talk down" technique for treatment of psychedelic drug intoxication, the procedure involves elimination of ambiguous or threatening stimuli (such as shadows, sudden bright lights, whispered voices, ringing telephones, etc.), protection of the sniffer

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and others from potential hostile outbursts, and the creation of a supportive and familiar environment (setting) in which continuous professional observation can be conducted unobtrusively.

Because of the lack of evidence that an abstinence syndrome exists, provision for gradual detoxification from solvents does not appear necessary.

Psychological Effects

Little controlled research has been carried out on the psychomotor effects of inhalants. An early study by Panse et al. (1954) reported that the intelligence quotient of toluene inhalers was not significantly different from that of a group of matched controls. A later study by Dodds and Santostefano (1964) of 12 boys ranging in age from 12 to 16 years, who had indulged in sniffing on a regular basis for 3 to 42 months, compared their performance to that of a group of control subjects on psychological tests designed to assess an individual's ability to maintain continuous attention and concentration, to solve problems in the face of distractions, and to exercise visual-motor coordination. Again, no significant statistical or qualitative differences were found between the two groups. The general conclusion that solvent inhalation does not adversely affect cognitive or motor performance has, in addition, been supported by Barman et al. (1964) and Nylander (1962).

Lynn and his colleagues (1972) have explored the cognitive effects of acute nitrous oxide administration in controlled trials with 11 subjects, aged 21 to 42. Five of the test subjects had had previous experience with marihuana and/or hallucinogenic drugs, while the remainder were drug naive. The conditions of administration were structured to closely approximate doses and methods seen in natural, street-using situations. The following psychological measures were employed: Digit Symbol Test (from the Wechsler Adult Intelligence Scale), Norrell's Symbol Analogies Test, and a simple addition exercise. The tests were administered prior to inhalation of nitrous oxide; at the time of peak drug effect, 5 minutes after inhalation, and 10 minutes after inhalation.

Statistical analyses revealed that all nitrous oxide subjects, while high, displayed significantly poorer scores for the Digit Symbol Test and the Symbol Analogies Test, but not the addition test. The lower levels of performance during the period of peak drug effect were found not only with respect to the number of correct responses, but with respect to the number of questions attempted and the percentage of total correct responses. No significant differences were found in any of the psychological measures between the pre-test and the 5 and 10 minute post-tests. The authors concluded that the duration of psychomotor impairment from nitrous oxide is extremely short (less than 5 minutes). That the psychomotor impairment in acute nitrous oxide intoxication may be hazardous is underscored by a report (Dillon 1967) of an individual who was involved in an automobile accident shortly after using the drug.

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Physiological Effects

The primary physiological concomitants of solvent use have been reviewed by Press and Done (1967a). Low hemoglobin values ranging from 7 to 11.8 mg./100 ml. in 30 glue sniffers were measured by Sokol and Robinson (1963); half of their patients also exhibited basophilic stippling of erythrocytes. In contrast, Press and Done (1967b) found no evidence of anemia in hematologic studies of 13 Salt Lake City glue sniffers. Two of 27 subjects screened by Massengale et al. (1963) displayed signs of eosinophilia (greater than 5 percent), as did 4 out of 13 of Press and Done's (1967b) patients and 25 out of 89 of those seen by Sokol and Robinson (1963). However, negative eosinophilia findings are reported by Barman et al. (1964) and Swedish investigators (Christiansson and Karlsson 1957).

Microscopic pyuria has been the most consistent urinary finding in glue sniffers, occurring in more than one-third of the patients seen by Press and Done (1967b). Other authors (Sokol and Robinson, 1963; Massengale et al. 1963) have noted microscopic hematuria in 7 to 19 percent of their subjects. Proteinuria was a common finding for Press and Done (1967b); it did not persist, however, and bore no particular relationship to the finding of abnormal urinary sediments.

Glue sniffing and aerosol inhalation do not seem to significantly alter blood urea nitrogen levels. Press and Done (1967b) found normal urea clearance in all but one of seven children tested. With the exception of two patients treated by Christiansson and Karlsson (1957), who displayed bromsulphalein retention, liver function tests have been uniformly normal in all reports to date.

The question of organic damage to the central nervous system, liver, kidneys, bone marrow, brain and other bodily systems due to chronic glue-sniffing has not been definitively resolved. Neurological examinations are infrequently reported, but when published are negative except for one instance of cerebellar disorder secondary to toluene inhalation (Grabski 1961).

In contrast to the volatile solvents, the physiological actions of nitrous oxide are rather benign. When given in combination with oxygen, the gas slightly depresses myocardial contractility by means of a direct action on the heart (Price and Helrich, 1955). Nitrous oxide also slightly increases the response of vascular smooth muscle to the sympathetic mediator, noradrenaline (Price and Price, 1962). In concentrations typically employed for anesthesia, nitrous oxide plus oxygen slightly elevate the resting respiratory minute volume without affecting the response to carbon dioxide (Eckenhoff and Helrich, 1958).

Adverse physiological reactions to nitrous oxide are rare. Lynn et al. (1972) in data gathered from over 100 self-reports of nitrous oxide use, failed to elicit even

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one adverse incident. In controlled studies, however, the drug produced nausea, bloated sensations, dry throat and one flashback reaction. The incidence of nausea when the gas is administered in a hospital or dental setting as an anesthetic is reported to be about 15 percent (Bodman et al. 1960).

Subjective Effects

Subjective experiences following the inhalation of the substances under consideration are known to vary from individual to individual and are highly dependent upon set (the psychological makeup of the user, his personality and expectations) and setting (the total environment in which the drug is used). Press and Done (1967b) have gathered self-reports of the following reactions subsequent to acute intoxication with glue and related solvents: inebriation similar to that seen in alcohol intoxication, bizarre thoughts, dizziness, euphoria, grandiosity, feelings of omnipotence, numbness, floating sensations, and distortions of space and time. Visual, and less commonly, auditory hallucinations occur, but apparently only in certain susceptible individuals.

The subjective effects of gasoline and related petroleum products include: unpleasant taste, nausea, loss of appetite, excessive salivation, drowsiness, weakness, lightheadedness, sense of spinning, moving, floating and magnetic pull; distorted space perception; altered shapes and colors, amnesia, euphoria, fear, guilt, and loneliness. Tolan and Lingl (1964) were able to elicit the following description of gasoline intoxication from a young boy who came to them for treatment:

> At first, I felt nauseated, real stuporous, light, like floating away. We were swinging our arms. Some of the boys were getting on the top of the garage and jumping off. Then I started to hear a constant buzzing as if someone was talking real fast. It sounded like echoes pretty far away. When talking to each other I could understand and I could see, but seeing a little bit more than usual. Then everything went back to normal, I guess I didn't take too much . . . . The second time I tried it . . . I felt like getting drunk. I was getting pretty high, higher than from drinking whiskey. I felt this kind of lightheadedness every time I inhaled the fumes. I started seeing little ants like crawling all over the ground real fast. There were billions. I felt like I was in a dream, like in another world. It does not seem like you're in reality. It gets to the point that you don't want to go back to reality. Then I saw walls change colors. One of the boys looked like a sailor with a blue suit, tie and hat all in colors. Then I felt I was floating again in the air; everything and everyone was smaller than normal size and in color . . . . The next morning I had a headache, but I felt like doing it again.

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The subjective effects of nitrous oxide were first described by Sir Humphrey Davy as:

> . . . analogous to gentle pressure on all the muscles attended by an highly pleasurable thrilling, particularly in the chest and the extremities . . . The sense of muscular power became greater, and at last an irresistible propensity to action was indulged in . . . Whenever its operation was carried to the highest extent, the pleasurable thrilling . . . gradually diminished, the sense of pressure on the muscles was lost; impressions ceased to be perceived; vivid ideas passed rapidly through the mind, and voluntary power was altogether destroyed, so that the mouthpiece generally dropt from my unclosed lips.

Lynn et al.'s (1972) study of the subjective effects of nitrous oxide revealed some interesting variations in responses in terms of prior drug experience. Subjects who were naive with respect to marihuana and hallucinogenic drugs likened the nitrous oxide experience to the effect of alcohol or sexual orgasm, while drug-experienced subjects felt the gas produced intense psychedelic effects over the course of the drug's 1 to 3 minute duration of action. All subjects regarded the nitrous oxide experience as pleasant; reports of calmness, euphoria and relaxation were predominant.

Legal Status

Organic solvents, airplane glues, aerosol products and related substances are not presently covered by the provisions of the Comprehensive Drug Abuse Prevention and Control Act of 1970 as revised (P.L. 91-513). No Federal penalties are imposed, therefore, for the possession or transfer of these agents. Several States and municipalities have, though, enacted legislation which restricts the sale of glue and related substances to minors. Nitrous oxide and related medical anesthetics are typically regarded as prescription drugs by the Nation's 50 States, and can be dispensed only upon direct authority of a physician or dentist. The penalties for possession and transfer of anesthetics vary from State to State.

Issues and Opinions

By far the most controversial issue surrounding glue-sniffing and related solvent misuse is the historical nature of the "nationwide drug menace" which emerged in the 1960's. To a large degree, Brecher (1972) contends that the "epidemic" was discovered, nurtured and exploded out of proportion by the news media, which published stories describing the most effective method of sniffing glue.

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> Interesting results were promised if the glue were sniffed as directed . . . In a word, it was like getting drunk . . . The effects of this newspaper article--and no doubt of other similar articles and broadcasts in other Denver mass media the matter--were visible by June 1960, when Denver police reported that during the past six months they had investigated some 50 cases of glue-sniffing. . . . Denver was thus experiencing what--so far as the available literature reveals--was the earliest of many similar local glue-sniffing epidemics throughout the country . . . Far from ending Denver's glue-sniffing epidemic, however, these warnings were followed by a further spread of the epidemic. The warnings seemed to function as lures.
>
> --Edward M. Brecher (1972)

Coupled with the controversies surrounding the role of the news media is a disparity in the opinion of experts with regard to the detrimental physical effects of glue and organic solvents:

> Although a great deal of concern about the ill effects of this practice is expressed by parents, school personnel, juvenile authorities, and the children themselves, very little is actually known about possible damage to organ systems resulting from deliberate inhalation of cement vapors. Many children share the so far unsubstantiated belief that glue-sniffing produces insanity and death, and we know of one case in which glue was first used by an adolescent boy in an attempt to commit suicide.
>
> --Helen Glaser and O. Massengale (1962)

> . . . (toluene) dulls the brain when it is inhaled and could kill a person. It can cause damage to the liver and bone marrow if it is taken in small repeated doses. The chemical has an irritating effect on the lungs and can cause pain, vomiting, headaches, confusion, and ultimately coma. It can also cause the heart to beat irregularly and can result in transient euphoria. The lethal dose is unknown.
>
> --Nassau County Health Department (1961)

The substance and value of the contradictory reports with regard to the hazards of solvent sniffing have been summed up by the National Clearinghouse for Poison Control Centers:

> By speculation, projection, and imagination, one can . . . build up quite a case for the potential hazards of the repeated inhalation of organic solvents such as those used in plastic cements. It behooves

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us, however, to ascertain facts in this regard. (One expert) inferred from his contact with a number of boys who practice glue-sniffing that the boys could and would give up the practice readily if they were convinced it was dangerous. At the same time, however, it became evident that the transparent misinformation or contradictory statements by authorities concerning the dangers of these practices would be completely disregarded by these boys and taken as evidence that none of the information was true. It also became apparent that, if the boys gave up glue-sniffing, they would take up other habits which would provide a comparable effect. (One expert) points out that, in our present state of knowledge, toluene (one of the more commonly used solvents in plastic cements) is considerably safer than many other organic solvents.

-- Edward M. Brecher (1972)

The National Clearinghouse for Drug Abuse Information, operated by the National Institute on Drug Abuse on behalf of the Special Action Office for Drug Abuse Prevention and the Federal agencies engaged in drug abuse education programs, is the focal point for Federal information on drug abuse. The Clearinghouse distributes publications and refers specialized and technical inquiries to Federal, State, local, and private information resources. Inquiries should be directed to the National Clearinghouse for Drug Abuse Information, P.O. Box 1908, Rockville, Maryland 20850.

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